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November 16, 1992

RECEIVED
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

Re: Comments on Second Report and Order/Further Notice of Proposed Rule Making
MM Docket No. 87-268

Dear Ms. Searcy:

Enclosed herewith are five copies (original and four) of the comments by this firm, "In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Service, Second Further Notice of Proposed Rule Making (Docket 87-268)".

If there are any questions, please do not hesitate to contact this office.

Sincerely,

COHEN, DIPPELL AND EVERIST, P.C.

Donald G. Everist (by W.P.)

Donald G. Everist
Secretary-Treasurer

DGE:mcw
Enclosure

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COHEN, DIPPELL AND EVERIST, P. C.

Before The

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C.

In the Matter of	)	
Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service	)	MM Docket No. 87-268

COHEN, DIPPELL AND EVERIST, P.C. SECOND FURTHER NOTICE OF PROPOSED RULE MAKING

Introduction

The following comments are provided by Cohen, Dippell and Everist, P.C. Consulting Engineers ("CDE") on the *Second Further Notice of Proposed Rule Making ("Notice")* adopted July 16, 1992 (released August 14, 1992). CDE and its predecessors have practiced before the Federal Communications Commission ("FCC") for more than fifty (50) years, representing the broadcast industry on professional engineering matters.

In the *Notice*, the Commission addressed certain issues relating to the development of channel allotments for advanced television (ATV) service. Further, the Commission outlined the policies, procedures and technical criteria that it believes will be used in the allotment[1/] of an additional 6 MHz for ATV for each existing broadcast station. The objective of the Commission action is to provide maximum ATV service to the American public while minimizing interference to existing NTSC systems and between proposed ATV stations.

In the action preceeding this *Notice* the Commission adopted a *Second Report and Order/Further Notice of Proposed Rule Making (Order/FNRPM)*. The Commission adopted

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[1/] A preliminary ATV allotment table was included.

policies and rules on issues assocated with the initial implementation of ATV service. Among other things, the Commission identified ATV as a further extension of improved television service; and that ATV service would be most efficiently rendered by existing broadcasters who would be permitted to implement the new service over a transition period. During the transition period the broadcasters could operate both the current NTSC channel and its new ATV facility. At the end of the transition period one channel would be relinquished.[2/] Further, the Commission found it essential that the ATV allotment process be in place at the time the ATV standard is adopted. In addition, when the Commission proposes a "final" ATV Table of Allotments broadcasters would be provided a fixed period of time to negotiate and submit plans for pairing NTSC and ATV channels.[3/]

The above decisions are interlinked with this *Notice* and the Commission has fostered an optimistic course for the ATV process to follow. However, as revealed in these comments, many technical issues do not lend themselves to being resolved at this time because many of the bedrock technical data and criteria to be derived from the Advanced Television Test Center ("ATTC") and the field tests are not yet available.[4/] Further, after the ATTC data is gathered, it needs to be studied, analyzed and assessed by the Commission as well as industry. For

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[2/]The Comission has not indicated how, once all channels are relinquished, the ATV channels assigned to protect NTSC operations will be reassigned to maximize service. We believe that this issue needs more attention by the Commission.

[3/]Uncertainty exists within the broadcast community as to which ATV channels are to be paired with existing NTSC operations. For example, the FCC did not place the coordinates of the various sites in the initial table, and therefore, identification could be misunderstood among the various parties which only have access to the initial document. Conversely, if specific assignments or pairings were not intended, this has been misunderstood.

[4/]Furthermore, the characteristics of the new ATV receivers are unknown with respect to potential of interference from multiple ATV transmissions with the various frequency spacings as provided in the Commission's draft ATV allotment table.

example, the Commission indicates in Paragraph 7 that the table will serve to provide broadcasters and other interested parties an opportunity to focus their comments on the proposed policies in the *Notice*.

But it fails to provide the important information regarding the technical parameters by which these very important allocation issues are framed. For example, such planning factors as the effective radiated power needs to be determined. Without such technical information, determinations of coverage and interference contours cannot be made[5/] even on a limited basis. Furthermore, the Commission has assumed that receiver performance criteria can be universally ignored. Without technical evidence, we cannot share the Commission's unbridled optimism. Nor has there been disclosures by the ATV proponents of what its system will require in terms of signal strength for TV reception. Without this information it is unknown what requirements will be placed on the consumer regarding the receiving antenna and whether special, extraordinary measures will be required. This leads to the conclusion that without adequate or sufficient information threshold determinations regarding coverage and interference cannot be made. Certainly what has not occurred is a vibrant discussion of overall system design.[6/] Without these very basic tenents, no meaningful studies or conclusions can be made.

A most important objective is to provide, after the 15 year transition period, an ATV channel to every licensed station that is interference-free out to 70 or 80 miles. Assuming all

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[5/] At least one proponent in its description of its limited off-the-air tests suggests that rather than wide area signal reception as now enjoyed by NTSC it appears that the ATV signal may be more of a point-to-point signal. If true, this will dramatically affect the timetable for acceptance by the general public.

[6/] Performance characteristics and requirements from the transmitter to the antenna input terminal of the receiver.

taboos, except co-channel and first adjacent channels can be removed, the TV spectrum can be "refarmed" to meet this wide area interference-free goal, particularly since UHF stations which now can only be assigned to 6 channel spacing, can be reallotted to every second channel. Accordingly, this refarming effort could increase a site separations between both co-channel and first adjacent channel stations.

Further spectrum needs are potentially required in order to provide ATV translator service around the loss-areas currently reached by NTSC service but beyond the useful ATV service radius. Unfortunately, the Commission in its "unbridled optimism" is ready to give away the "store" for land mobile interests. This may be the very death knell to off-the-air television if inadequate co-channel and first-adjacent channel spacings are forced on broadcasters and so-called "surplus" frequency spectrum is lost.

Allotment Table

The *Notice* has provided an initial allotment table. However, based upon the limited information disclosed by the Commission in the *Notice*, no assessment can be made whether the plan is the most suitable for television. For example, based upon the channel distributions listed in Table 1, it appears that the Commission has selected the higher UHF channels[7/] to carry the burden of ATV allotments.

Based upon our many years of experience in working on issues relating to the radiofrequency environment, it is our firm opinion that placing any television signal on the upper UHF band is fraught with service inequities when compared with the VHF band or even the

[7/]See Figure 1 attached which is a graph depicting the number of ATV allotments by UHF channel.

lower portions of the UHF band. One has only to look at the signal losses that increase with frequency whether it is in the transmission line, path obstruction losses, free-space losses or other. This is evident in the many FCC proceedings over the past 30 years in which high numbered UHF channels have either been converted to VHF channels or have been assigned a lower UHF channel. CDE cannot recall a single instance where a commercial station has voluntarily requested a higher UHF channel. Compared to existing NTSC coverage, equivalent ATV service areas will be difficult to achieve if sole reliance is placed on an allotment table whose basic premise is to use the highest available frequencies.[8/]

Receiver Taboos

Special consideration may be necessary in order to avoid unwanted receiver artifacts. For example, the FCC draft ATV table places heavy reliance on "bundling" ATV frequenices. Bundling can be defined as grouping channels very close in frequency to one another. Not only do special transmission considerations result, but also CDE believes that a special set of receiver concerns may occur. In the attached Appendix A, CDE outlines some receiver considerations that may manifest themselves with the current draft ATV table. CDE urges the FCC to take special precautions to ensure that full consideration, evaluation, and adoption of appropriate constraints are made to prevent unwanted allotment defects due to receiver characteristics and limitations.

[8/]It is to be noted that the FCC states in Paragraph 27, "[to] maximize the expected coverage areas of ATV stations, our allotment decisions will attempt to optimize the distances between new ATV allotments and between new ATV allotments and existing NTSC stations". We think the Commission has the "cart before the horse". The basic goal, if off-the-air television is to be a viable service, is that ATV service must, as a minimum, be equivalent to that provided by existing stations and capable of being received at the viewer's home without special and extraordinary means. To do otherwise forecloses off-the-air television's full ability to compete.

Coverage Issues

The Commission apparently is going to restrict or limit ATV service out to a maximum of 55 miles (88.5 km).[9/] This represents a potential short fall of off-the-air signals to outlying areas represented by a 25 mile wide annulus ring representing an area of 10,600 square miles (27,500 square kilometers). A 50% loss in service area for many VHF stations could result. This will then place further burdens on frequency management as translators will need to be assigned and built to fill these ATV service voids. This will exacerbate the spectrum demands for both ATV and NTSC translators. Many of the current NTSC translators could be displaced by any ATV allotment plan. Loss of NTSC translators and ATV interference within existing NTSC coverage areas will further increase the reliance on cable television or other means.[10/]

As a result of recent proceedings (General Dockets 80-113, 90-54, and 90-5), the Commission now authorizes microwave frequencies (2,500-2,686 MHz) to provide "alternative services" via MMDS in order to provide some competition to cable television.

In one fell swoop, the Commission will effectively eliminate a large area of competitive off-the-air signals received from television stations.

In order to demonstrate the predicted loss in coverage area, four cities were selected to determine the ATV 55-mile radius service area compared to the current NTSC Grade B service areas. Attached as Figures 4 through 11 are maps comparing current commercial and non-commercial educational Grade B contours to a 55-mile ATV service area. The loss areas are

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[9/]Current NTSC low-band VHF stations enjoy a predicted Grade B coverage contour out to 80 miles (129 km).

[10/]This can be an important consideration to economically disadvantaged households.

shaded to highlight the service area lost. This will potentially result in a generation of large white areas in many situations, which will require TV service delivery by other means.

Summary

CDE urges the FCC to select an ATV system and allotment plan which replicates the existing NTSC service areas and to base that selection after all technical issues have been examined, studied and reviewed. CDE believes that is the only framework that a viable ATV transition plan can be implemented.

Respectfully Submitted,

Donald G. Everist

S. K. Khanna

Sudhir K. Khanna

Warren M. Powis

Warren M. Powis

Wilson A. La Follette

Date: November 16, 1992

COHEN, DIPPELL AND EVERIST, P. C.

TABLE 1

THE NUMBER OF EACH ATV CHANNEL IN THE U.S.

SEPTEMBER 1992

ATV Channel Number	Number of Allotments	ATV Channel Number	Number of Allotments
14	15	42	37
15	21	43	37
16	24	44	33
17	19	45	34
18	21	46	33
19	24	47	37
20	21	48	32
21	22	49	33
22	26	50	38
23	24	51	33
24	24	52	38
25	25	53	38
26	19	54	38
27	29	55	36
28	31	56	45
29	31	57	40
30	39	58	40
31	32	59	44
32	28	60	47
33	26	61	45
34	35	62	46
35	30	63	40
36	33	64	38
37	none	65	41
38	39	66	41
39	37	67	45
40	35	68	40
41	39	69	49

APPENDIX A

1. NTSC and ATV Television Receiver Issues

a. Introduction

It is understood that in order to avoid the present UHF +/- 14 and +/- 15 channel image problems experienced with current NTSC receivers[11/] that future ATV receivers would utilize an IF frequency of around 900 MHz. This technique was employed by Texas Instruments, Inc. ("TI") when it developed a prototype television receiver designed to meet minimum specified performance figures concerning UHF taboo restrictions. The FCC reported on its tests of the TI prototype receiver[12/] which incorporated an IF frequency of 346 MHz.

The FCC performance tests of the TI receiver indicated that susceptibility to interference from transmissions located 14 or 15 channels above the desired television channel was much better than achieved from the mean conventional receiver. However, the TI receiver performance for intermodulation n, n+2, n+4 and n, n-2, n-4 cases was only "average" or somewhat worse than average when compared to the mean performance of 47 conventional

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[11/]Current standard IF frequency is 41.25 MHz.

[12/]See report entitled, "A study of the Characteristics of the FCC Prototype TV Receiver Relative to Conventional Receiver UHF Taboos, Project No. 2229-72, FCC/OCE LAB78-01, February 1978".

receivers. It appears that use of higher IF frequencies will result in a "trade-off" of reduced intermodulation performance.[13/]

b. Cross-Modulation and Intermodulation

Cross-modulation tests on the TI receiver at -35 dBm desired signal level indicated a D/U ratio of 42 dB. However, the introduction of a third signal resulted in a 18 to 19 dB degradation in receiver immunity to a D/U ratio of 23 to 24 dB. CDE is unaware of any test data which documents the effect of adding a fourth or fifth high level signal on nearby frequencies in combinations such as (n-4, n-2, n, n+2), (n-2, n-1, n, n+1, n+3), etc.

The Commission's draft allotment plan[14/] contains many area allotments with non-traditional close channel spacings which raise multiple intermodulation questions. Examples are shown below in Table A.

[13/]Once a final standard ATV if frequency is selected, other potential new receiver taboos will need to be determined.

[14/]Refer Appendix D contained in the Second Further Notice of Proposed Rule Making in MM Docket No. 87-268, adopted July 16, 1992, released August 14, 1992.

TABLE A
SAMPLE INTERMODULATION COMBINATIONS RESULTING FROM THE FCC DRAFT ATV TABLE OF ALLOTMENTS

City/State	Channels	Sample Intermodulation Combination
Washington, DC	26 NTSC	n-4
	29 ATV	n-1
	30 ATV	n
	32 NTSC	n+2
	34 ATV	n+4
	35 ATV	n+5
Baltimore, MD	38 ATV	n-3
	39 ATV	n-2
	41 ATV	n
	44 ATV	n+3
	45 NTSC	n+4
Portland, OR/ Vancouver, WA	44 ATV	n-5
	46 ATV	n-3
	49 NTSC	n
	50 ATV	n+1
	52 ATV	n+2
Minneapolis, MN	57 ATV	n-4
	59 ATV	n-2
	61 ATV	n
	64 ATV	n+3

Table A above provides examples of intermodulation channel spacings out to plus and minus 5. The intermodulation impact of frequencies out beyond +/- 5 channels may also be a consideration if high IF frequencies are employed in ATV receivers. CDE suggests that the Commission perform or oversee multiple intermodulation tests for cases of mixed (NTSC and ATV) and ATV intermodulation sources to existing NTSC receivers and candidate ATV receivers if such data is not currently available. These tests (field tests or laboratory tests)

should be performed prior to establishing any final ATV allotment plan and should be expanded to including any other potential interference susceptibility mechanisms.

c. Image Protection of NTSC Television Reception

Under Appendix B of the Tentative Decision, the Commission placed its Technical Memorandum in the record; entitled, "Analysis of UHF-TV Receiver Interference Immunities Considering Advanced Television", OET Technical Memorandum, FCC/OET, TM 88-2 ("OET Memorandum"). In the OET Memorandum, the FCC reported on the results of the immunity of 15 NTSC television receivers to various types of induced interference for plus and minus 1, 2, 4, 7, 8, 14, and 15 channels from the desired vicinity channel.

The Commission's frequency studies for new ATV allotments in its Tentative Decision and in its Second Further Notice ignored all taboos, except for co-channel and first-adjacent channel. The susceptibility of the existing millions of NTSC receivers to picture image (n+15 channels) and sound image (n+14 channels) interference cannot be dismissed lightly. Based on ratios presented by the FCC in its Tentative Decision, the susceptibility of NTSC receivers to picture image (n+15) interference is approximately 14 dB to 20 dB worse than for first-adjacent channel (n+1,n-1) interference. Similarly, sound image (n+14) interference is less severe than picture image interference at approximately 1 dB to 5 dB better than first-adjacent channel interference. However, since NTSC sound carrier levels are approximately 10 dB lower than visual carrier levels, ATV n+14 interference susceptibility may be up to 10 dB worse, equivalent to 5 dB to 9 dB worse than first-adjacent channel interference.

In order to minimize or remove the potential of widespread severe image interference to existing NTSC reception, ATV channels on image channels should either be collocated with the affected NTSC station or removed from it by approximately 75 miles or more.

2. ATV Allotment Plan

The draft ATV allotment plan included with the Commission's Second Further Notice contained:

- ATV allotments first-adjacent to each other in a single community.
- ATV allotments located at less than the desired minimum 55 mile spacing to first-adjacent channel NTSC stations.
- Numerous collocated ATV allotments on channels first-adjacent to NTSC stations.
- ATV allotments located between 97 and 125 miles from NTSC co-channel stations.
- ATV allotments located closer than the desired minimum 125 mile co-channel spacing to other ATV allotments.
- ATV allotments on image channels to existing NTSC stations.

The above techniques were apparently used as a compromise between NTSC and ATV interference-free service in order to achieve the requisite minimum number of allotments in large metropolitan areas such as New York, Detroit, Washington/Baltimore. However, these techniques may not offer the best channelling solutions for the smaller markets. Risks with the FCC plan for ATV allotments include a country-wide frequency reorganization after retirement of the NTSC stations.

This office reviewed existing NTSC station channelling in several top 100 markets to establish if ATV allotments could be assigned using the 160 km co-channel and 96 km first-adjacent channel spacing criteria set forth in the Commission's Tentative Order. In addition, potential ATV allotments were not considered if they were on image channels to existing NTSC stations. We found that ATV assignments could be made on a predicted

non-interference basis to NTSC stations. For example, in the Knoxville, Tennessee, area potential ATV channels are 17, 23, 31, 34, 36, 38, 46, 48, 50, 52, 56, 59, 63, 65, and 67. Any of the channels could be simultaneously allotted for ATV use without creating first-adjacent or image interference to licensed NTSC stations. Proper choice of a table of allotments for the Knoxville area would most likely circumvent the future need for rechannelling ATV stations after the end of the transition period when NTSC stations cease operation.

3. Digital System Artifacts

Typical 6 MHz wide digital transmission systems exhibit out of band signal out to 6 MHz each side of the desired pass band that are only 35 dB below the in band spectra. The effects of first-adjacent out of band radiation to other operations are unknown and require quantification by the FCC prior to deriving a final ATV allotment plan. Items requiring attention include adjacent channel interference to:

- NTSC stations
- Other ATV stations
- Radio astronomy Channel 37 scientific monitoring of deep space
- Adjacent land-mobile two-way operations below Channel 14 (470 MHz) and above Channel 69 (806 MHz).

4. Zone III Considerations

In the other Sixth Report and Order in Docket 8736, 8975, 9175, and 8976, the FCC designated the Gulf Coast area as Zone III. It recognized high levels of tropospheric propagation may be expected in this area and provided for greater minimum co-channel distance separations between television stations. It is unfortunate that the current Commission has chosen to ignore this factor to date in Docket No. 87-268.

Comments from our FM and TV clients in Zone III have confirmed high signal levels from distant co-channel and adjacent-channel stations. Another phenomenon reported involved self-ghosting of UHF-TV stations within 10 to 20 miles of the transmitter site. The apparent multiple reflections from the ducting layer have made NTSC pictures unwatchable. It is believed that this phenomenon will also impact ATV signals.

5. Receive Antennas

Many NTSC receivers use portable antennas (rabbit-ear/movable monopole/bow tie/single turn loop). These antennas may provide a viewer-acceptable NTSC picture (compromise). When one walks near the receiver or wind blows nearby power lines and trees, the picture quality often suffers.

In order to ensure perfect or near perfect bit-error rates from ATV digital transmissions, these easy receive-antenna solutions just will not suffice. High-gain, wide-bandwidth, high front to back ratio outdoor antennas, possibly with remote-controlled motorized rotators will be the rule, rather than the exception in American households. Since many households possess several receivers, a high-quality amplified distribution mini-cable system may be required to feed all the receivers in each household from an outdoor antenna. Multiple dwelling unit styles of housing which have restrictive covenants on outdoor antennas may forced to shift their viewing from free off-the-air television to pay-per-month cable systems.

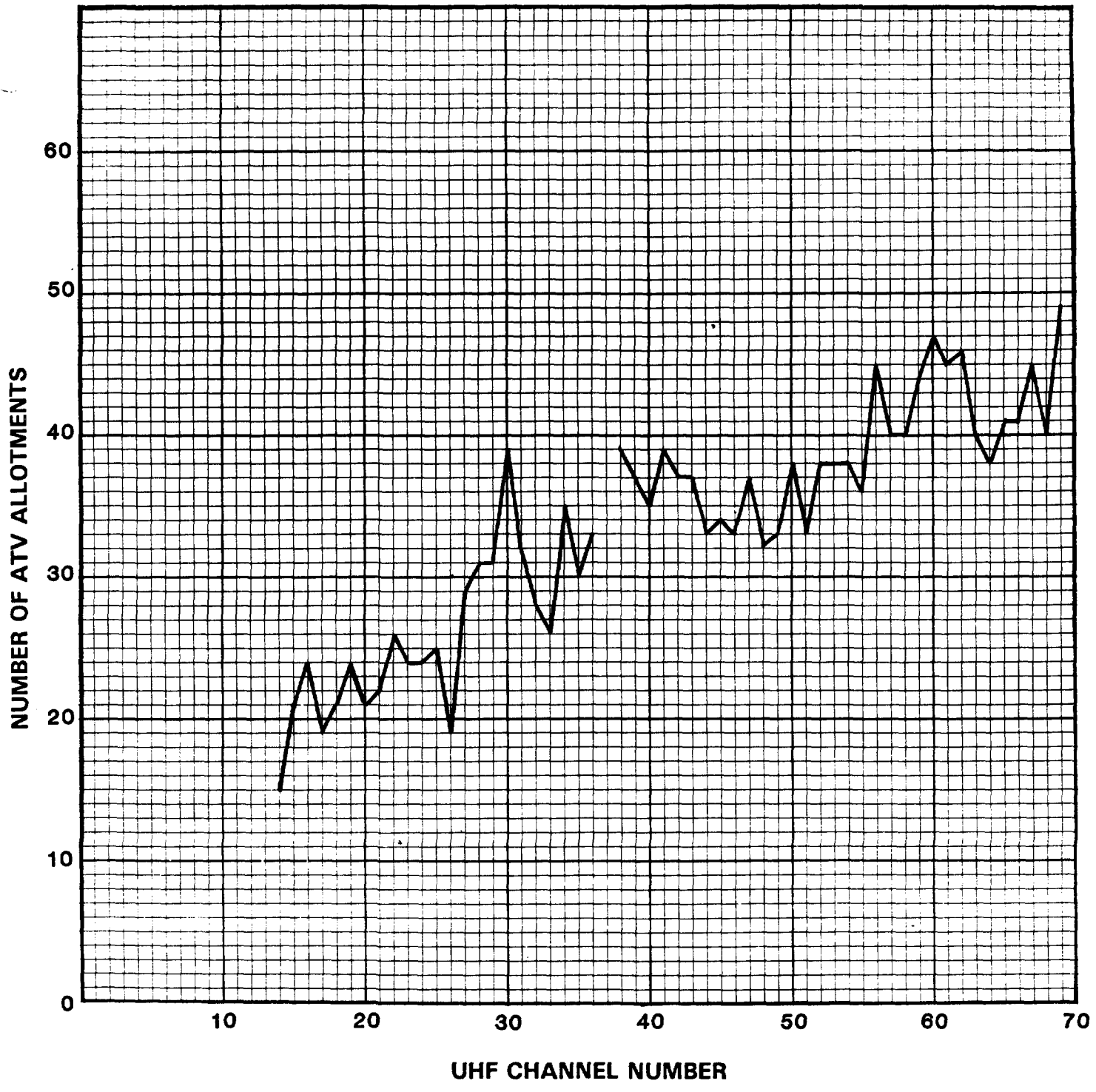
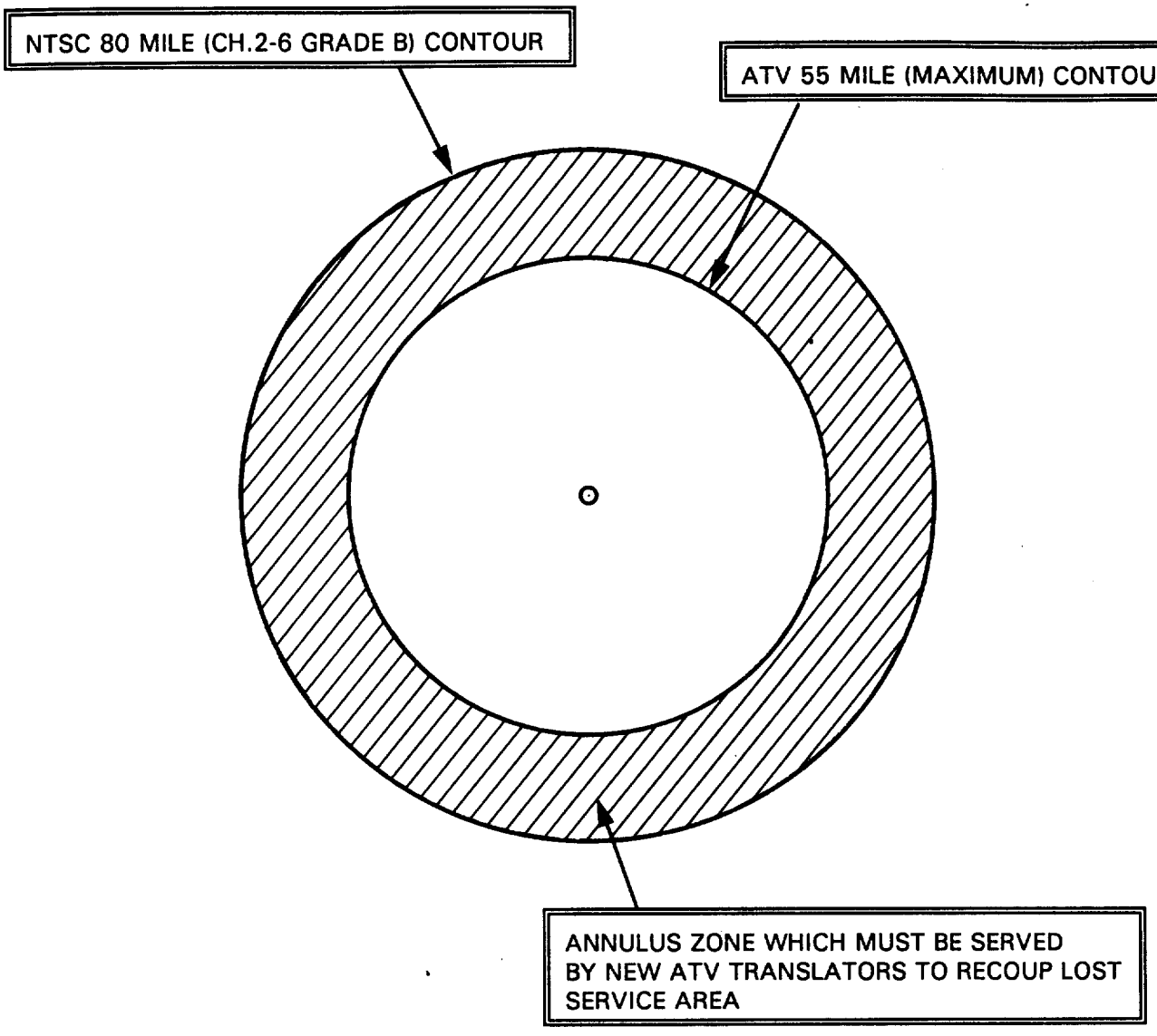


FIGURE 1
GRAPH DEPICTING NUMBER OF UHF ATV ALLOTMENTS
FROM THE DRAFT PLAN CONTAINED IN
THE SECOND FURTHER NOTICE
OCTOBER 1992

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC

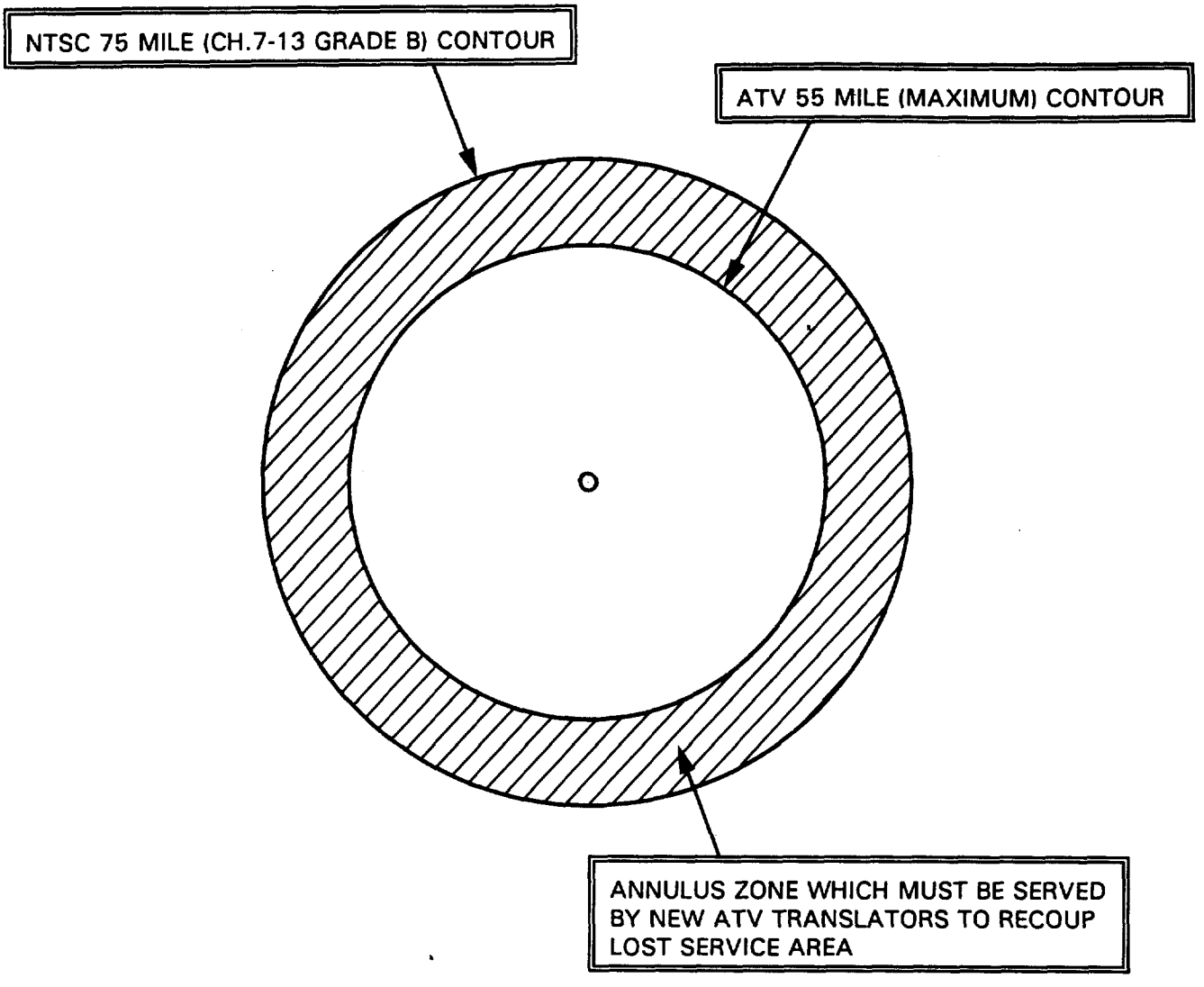


CH.2-6 SERVICE AREA 20,100 SQ. MILES
ATV SERVICE AREA 9,500 SQ. MILES
LOSS AREA 10,600 SQ. MILES (53%)

FIGURE 2

DIAGRAM OF LOSS AREA RESULTING FROM CONVERSION FROM VHF NTSC TO UHF ATV OFF-AIR SERVICE

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC



CH.7-13 SERVICE AREA 17,700 SQ. MILES
ATV SERVICE AREA 9,500 SQ. MILES
LOSS AREA 8,200 SQ. MILES (46%)

FIGURE 3

DIAGRAM OF LOSS AREA RESULTING FROM CONVERSION FROM VHF NTSC TO UHF ATV OFF-AIR SERVICE

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC

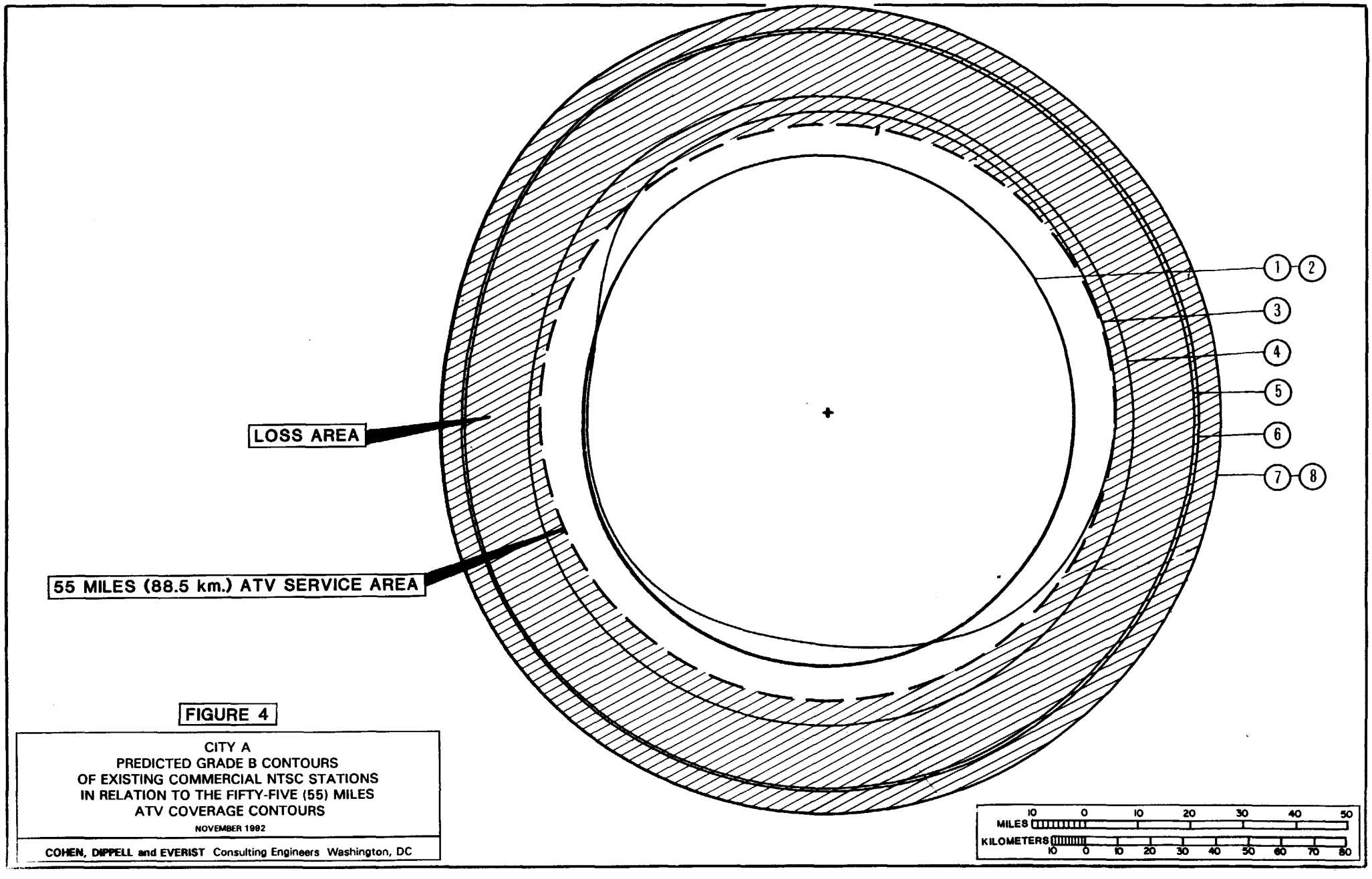


FIGURE 4

CITY A
PREDICTED GRADE B CONTOURS
OF EXISTING COMMERCIAL NTSC STATIONS
IN RELATION TO THE FIFTY-FIVE (55) MILES
ATV COVERAGE CONTOURS

NOVEMBER 1992

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC

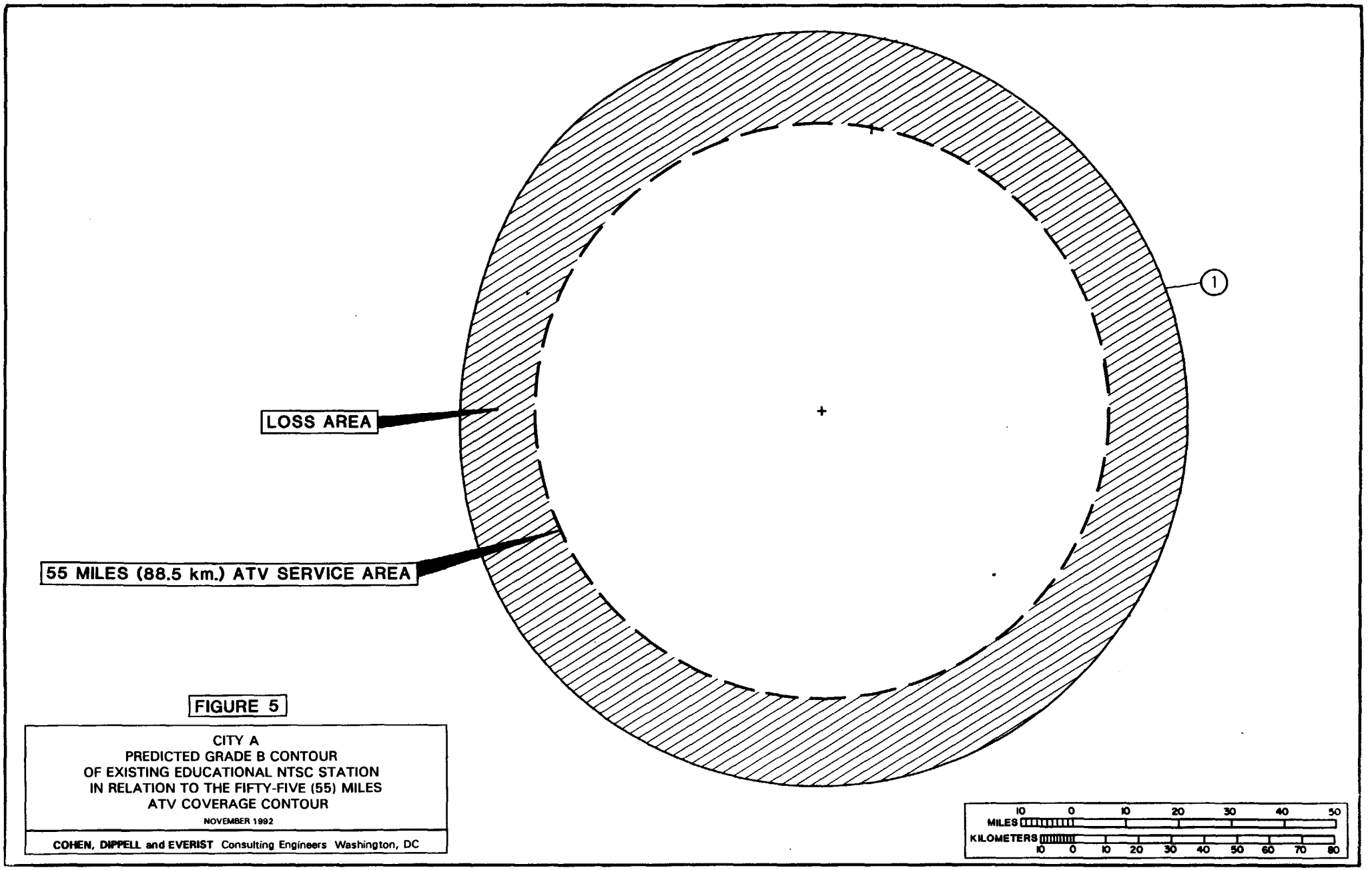


FIGURE 5

CITY A
PREDICTED GRADE B CONTOUR
OF EXISTING EDUCATIONAL NTSC STATION
IN RELATION TO THE FIFTY-FIVE (55) MILES
ATV COVERAGE CONTOUR

NOVEMBER 1992

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC

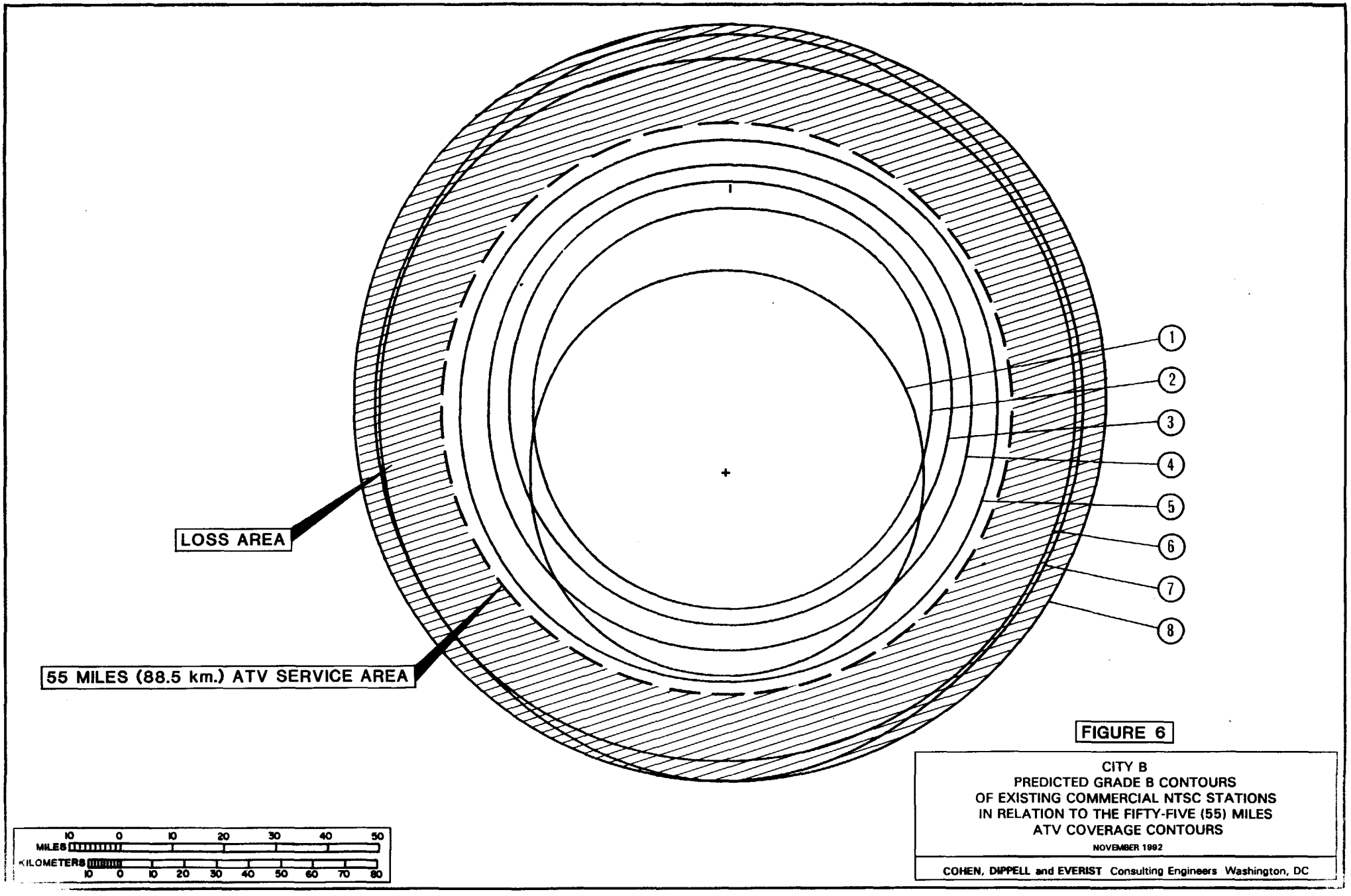


FIGURE 6

CITY B
PREDICTED GRADE B CONTOURS
OF EXISTING COMMERCIAL NTSC STATIONS
IN RELATION TO THE FIFTY-FIVE (55) MILES
ATV COVERAGE CONTOURS

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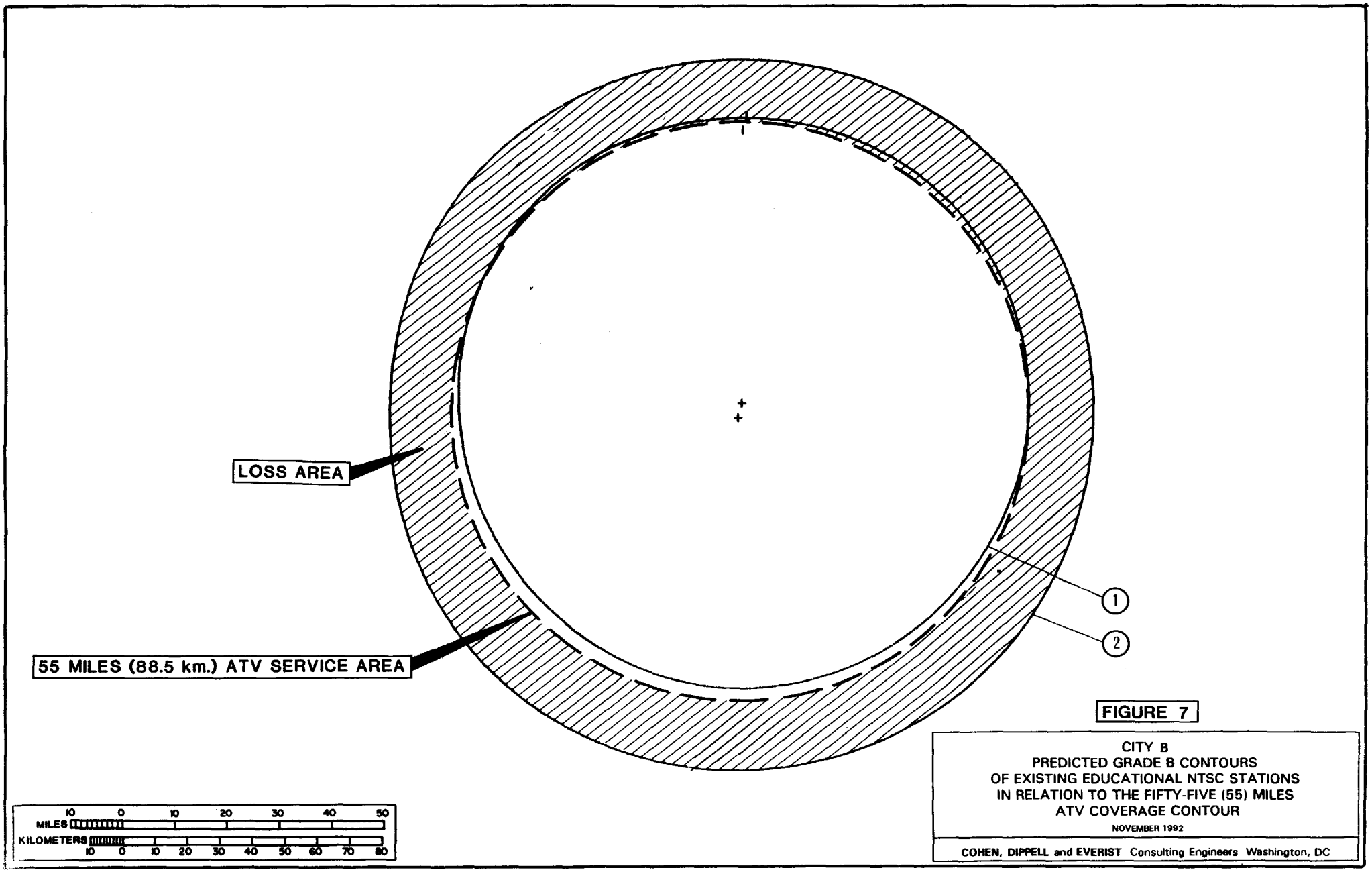

FIGURE 7

CITY B
PREDICTED GRADE B CONTOURS
OF EXISTING EDUCATIONAL NTSC STATIONS
IN RELATION TO THE FIFTY-FIVE (55) MILES
ATV COVERAGE CONTOUR

NOVEMBER 1992

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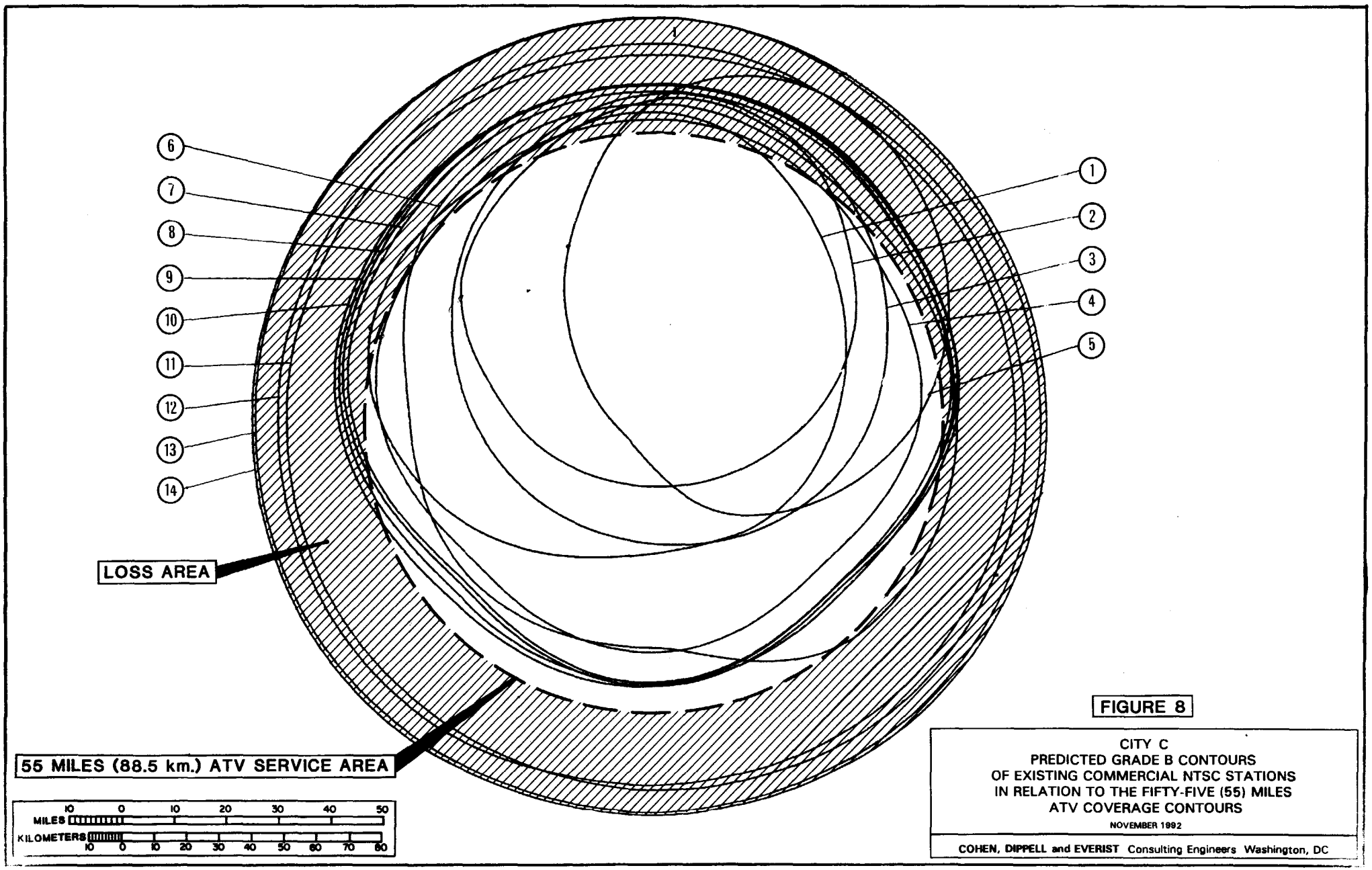

FIGURE 8

CITY C
PREDICTED GRADE B CONTOURS
OF EXISTING COMMERCIAL NTSC STATIONS
IN RELATION TO THE FIFTY-FIVE (55) MILES
ATV COVERAGE CONTOURS

NOVEMBER 1992

COHEN, DIPPELL and EVERIST Consulting Engineers Washington, DC